

2-2.3.2 of ANSI/NFPA 59A with the following exceptions: (a) Flammable vapor-gas dispersion distances must be determined in accordance with the model described in the Gas Research Institute report GRI-89/0242, "LNG Vapor Dispersion Prediction with the DEGADIS Dense Gas Dispersion Model." Alternatively, in order to account for additional cloud dilution which may be caused by the complex flow patterns induced by tank and dike structure, dispersion distances may be calculated in accordance with the model described in the Gas Research Institute report GRI 96/0396.5, "Evaluation of Mitigation Methods for Accidental LNG Releases. Volume 5: Using FEM3A for LNG Accident Consequence Analyses". The use of alternate models which take into account the same physical factors and have been validated by experimental test data shall be permitted, subject to the Administrator's approval.

(b) The following dispersion parameters must be used in computing dispersion distances:

(1) Average gas concentration in air = 2.5 percent.

(2) Dispersion conditions are a combination of those which result in longer predicted downwind dispersion distances than other weather conditions at the site at least 90 percent of the time, based on figures maintained by National Weather Service of the U.S. Department of Commerce, or as an alternative where the model used gives longer distances at lower wind speeds, Atmospheric Stability (Pasquill Class) F, wind speed = 4.5 miles per hour (2.01 meters/sec) at reference height of 10 meters, relative humidity = 50.0 percent, and atmospheric temperature = average in the region.

(3) The elevation for contour (receptor) output $H = 0.5$ meters.

(4) A surface roughness factor of 0.03 meters shall be used. Higher values for the roughness factor may be used if it can be shown that the terrain both upwind and downwind of the vapor cloud has dense vegetation and that the vapor cloud height is more than ten times the height of the obstacles encountered by the vapor cloud.

(c) The design spill shall be determined in accordance with section 2-2.3.3 of ANSI/NFPA 59A.

[Amdt. 193-17, 65 FR 10959, Mar. 1, 2000]

§ § 193.2061–193.2065 [Reserved]

§ 193.2067 Wind forces.

(a) LNG facilities must be designed to withstand without loss of structural or functional integrity:

(1) The direct effect of wind forces;

(2) The pressure differential between the interior and exterior of a confining, or partially confining, structure; and

(3) In the case of impounding systems for LNG storage tanks, impact forces and potential penetrations by wind borne missiles.

(b) The wind forces at the location of the specific facility must be based on one of the following:

(1) For shop fabricated containers of LNG or other hazardous fluids with a capacity of not more than 70,000 gallons, applicable wind load data in ASCE 7.

(2) For all other LNG facilities:

(i) An assumed sustained wind velocity of not less than 150 miles per hour, unless the Administrator finds a lower velocity is justified by adequate supportive data; or

(ii) The most critical combination of wind velocity and duration, with respect to the effect on the structure, having a probability of exceedance in a 50-year period of 0.5 percent or less, if adequate wind data are available and the probabilistic methodology is reliable.

[45 FR 9203, Feb. 11, 1980, as amended by Amdt. 193-1, 45 FR 57419, Aug. 28, 1980; 58 FR 14522, Mar. 18, 1993; Amdt. 193-16, 63 FR 37505, July 13, 1998; Amdt. 193-17, 65 FR 10959, Mar. 1, 2000]

§ § 193.2069–193.2073 [Reserved]

Subpart C—Design

§ 193.2101 Scope.

Each LNG facility designed after March 31, 2000 must comply with requirements of this part and of ANSI/NFPA 59A. In the event of a conflict

§§ 193.2103–193.2117

between this part and ANSI/NFPA 59A, this part prevails.

[Amdt. 193–17, 65 FR 10959, Mar. 1, 2000]

MATERIALS

§§ 193.2103–193.2117 [Reserved]

§ 193.2119 Records

Each operator shall keep a record of all materials for components, buildings, foundations, and support systems, as necessary to verify that material properties meet the requirements of this part. These records must be maintained for the life of the item concerned.

DESIGN OF COMPONENTS AND BUILDINGS

§§ 193.2121–193.2153 [Reserved]

IMPOUNDMENT DESIGN AND CAPACITY

§ 193.2155 Structural requirements.

(a) The structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of the following:

- (1) The imposed loading from—
 - (i) Full hydrostatic head of impounded LNG;
 - (ii) Hydrodynamic action, including the effect of any material injected into the system for spill control;
 - (iii) The impingement of the trajectory of an LNG jet discharged at any predictable angle; and
 - (iv) Anticipated hydraulic forces from a credible opening in the component or item served, assuming that the discharge pressure equals design pressure.
- (2) The erosive action from a spill, including jetting of spilling LNG, and any other anticipated erosive action including surface water runoff, ice formation, dislodgement of ice formation, and snow removal.
- (3) The effect of the temperature, any thermal gradient, and any other anticipated degradation resulting from sudden or localized contact with LNG.
- (4) Exposure to fire from impounded LNG or from sources other than impounded LNG.
- (5) If applicable, the potential impact and loading on the dike due to—

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(i) Collapse of the component or item served or adjacent components; and

(ii) If the LNG facility adjoins the right-of-way of any highway or railroad, collision by or explosion of a train, tank car, or tank truck that could reasonably be expected to cause the most severe loading.

(b) An LNG storage tank must not be located within a horizontal distance of one mile (1.6 km) from the ends, or ¼ mile (0.4 km) from the nearest point of a runway, whichever is longer. The height of LNG structures in the vicinity of an airport must also comply with Federal Aviation Administration requirements in 14 CFR Section 1.1.

[45 FR 9203, Feb. 11, 1980, as amended by Amdt. 193–17, 65 FR 10959, Mar. 1, 2000]

§§ 193.2157–193.2159 [Reserved]

§ 193.2161 Dikes, general.

An outer wall of a component served by an impounding system may not be used as a dike unless the outer wall is constructed of concrete.

[Amdt. 193–17, 65 FR 10959, Mar. 1, 2000]

§§ 193.2163–193.2165 [Reserved]

§ 193.2167 Covered systems.

A covered impounding system is prohibited except for concrete wall designed tanks where the concrete wall is an outer wall serving as a dike.

[Amdt. 193–17, 65 FR 10959, Mar. 1, 2000]

§§ 193.2169–193.2171 [Reserved]

§ 193.2173 Water removal.

(a) Impoundment areas must be constructed such that all areas drain completely to prevent water collection. Drainage pumps and piping must be provided to remove water from collecting in the impoundment area. Alternative means of draining may be acceptable subject to the Administrator's approval.

(b) The water removal system must have adequate capacity to remove water at a rate equal to 25% of the maximum predictable collection rate from a storm of 10-year frequency and 1-hour duration, and other natural causes. For rainfall amounts, operators must use the “Rainfall Frequency